Name: Key Class: _____ Date: _____ ID: A

Review #2

Short Answer

Determine whether each sequence is geometric, arithmetic, or neither. Justify your answer.

1. (1 point) 5, −10, 20, −40, … geo. $r=-2$

2. (1 point) $\frac{1}{3}, \frac{2}{3}, 1, \frac{4}{3}, \ldots$ arith. $d=\frac{1}{3}$

For each geometric sequence, determine
a) an explicit formula for the general term
b) t_{11}

3. ~~(1 point)~~ $t_1 = 3$, $r = 2$

$t_n = 3(2)^{n-1}$ $t_{11} = 3072$.

For each arithmetic series, determine
a) an explicit formula for the general term
b) a formula for the general sum
c) t_{12}
d) S_n

4. (1 point) $-12 - 9 - 6 - \cdots + 12$

a) $t_n = -12 + (n-1)(3)$ b) $S_n = \frac{n}{2}(2(-12)+(n-1)(3))$

Determine the sum of each arithmetic series.

5. (1 point) $t_1 = 3\sqrt{3}$, $d = -2\sqrt{3}$, $n = 11$

$S_{11} = \frac{11}{2}(2(3\sqrt{3}) + 10(-2\sqrt{3}))$

$S_{11} = 5.5(6\sqrt{3} - 20\sqrt{3})$

$S_{11} = 5.5(-14\sqrt{3})$

$S_{11} = -77\sqrt{3}$

$S_n = \frac{n}{2}(3n-27)$

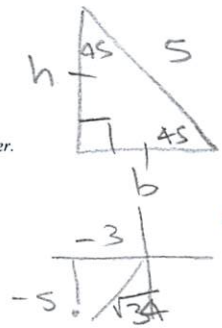
c) $t_{12} = 21$

d) $12 = -12 + (n-1)(3)$

$24 = 3(n-1)$

$8 = n-1$

$9 = n$ $S_9 = \frac{9}{2}(27-27) = 0$



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6. (1 point) The hypotenuse of a right isosceles triangle is 5 cm long.
a) Write an exact expression for the base and the height of the right triangle, using primary trigonometric ratios.
b) Use your expressions to determine the exact area of the triangle.

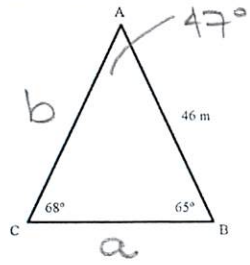
a) $\sin 45 = \frac{b}{5}$ $b = 5\sin 45 = 5/\sqrt{2}$ $h = 5\sin 45 = 5/\sqrt{2}$

b) $A = \frac{1}{2}\left(\frac{5}{\sqrt{2}}\right)\left(\frac{5}{\sqrt{2}}\right) = 6.25\ cm^2$

7. (1 point) The point A(−3, −5) is on the terminal arm of an angle θ. Determine exact expressions for the primary trigonometric ratios for the angle.

$\sin\theta = -5/\sqrt{34}$ $\cos\theta = -3/\sqrt{34}$ $\tan\theta = 5/3$

8. ~~(1 point)~~ ~~A survey of a plot of land is shown. The plot is to have a~~ hedge along its border. How many linear metres of hedge are needed, to the nearest tenth of a metre?



$\frac{\sin 68}{46} = \frac{\sin 47}{a} = \frac{\sin 65}{b}$

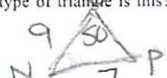
$a = 36.3$

$b = 45.0$

perimeter = 127.3 m

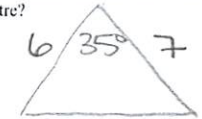
9. (1 point) In acute ΔNOP, $o = 7$ cm, $p = 9$ cm, and ∠O = 50°. Solve ΔNOP. What type of triangle is this? ASS!

$9\sin 50 < 7 < 9$ ✓



2 Δ's.

10. ~~(1 point)~~ Diana is designing a triangular race course for a sailing regatta. The course is triangular and has a 35° angle between two sides of 7 km and 6 km. What is the length of the third side of the race course, to the nearest kilometre?



$c^2 = 6^2 + 7^2 - 2(6)(7)\cos 35°$

$c =$ 4 km

$\frac{\sin 50}{7} = \frac{\sin P}{9}$

$\angle P_1 = 80°$ $\angle P_2 = 100°$

$\angle N_1 = 50°$ $\angle N_2 = 30°$

$n = 7$ cm isosceles!

$\frac{\sin 50}{7} = \frac{\sin ?}{n}$

$n = 4.6$ cm

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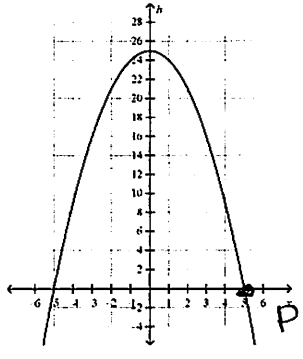
11. (1 point) a) For the given trigonometric ratio, determine two other angles that give the same value.
i) sin 45°
ii) tan 300°
iii) cos 120°
b) Explain how you determined the angles in part a). coterminal angles ;

i) $-315°, 405°$ ii) $-60°, 660°$ iii) $-240°, 480°$

12. (1 point) State the vertex of the function $y = -3(x-2)^2 - 3$. $V(2, -3)$

13. (1 point) An architect is using the graph to model an arch-shaped window, where h is the height of the window, in metres, and x is the horizontal position from the centre of the arch. Write the function in standard form represented by the graph and state the domain and range of the function.



D: $-5 \leq x \leq 5$.

R: $0 \leq y \leq 25$.

P(5, 0)
x y

$y = ax^2 + 25$.

$0 = a(5)^2 + 25$.

$-25 = 25a$

$-1 = a$

$\boxed{y = -x^2 + 25}$

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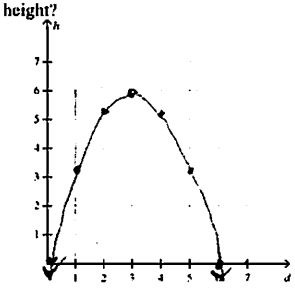
14. (1 point) Water spraying from a large fountain follows a path modelled by the function $h(d) = -\frac{2}{3}d^2 + 4d$, for $h \geq 0$, where h is the height of the water above the fountain jet and d is the horizontal distance of the water from the fountain jet, both in metres.
a) Graph the function and use the graph to determine the maximum height of the fountain.
b) What horizontal distance does the water travel from the fountain jet before it reaches the maximum height?



a) $h(d) = -\frac{2}{3}(d^2 - 6d + 9 - 9)$

$= -\frac{2}{3}(d-3)^2 + 6$

max height = 6m.

b) the water travels 3m.

I used the x-int!

c) $y = -\frac{1}{5}x(x-30)$

$y = -\frac{1}{5}x^2 + 6x$

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15. (1 point) Suppose a person on the surface of an asteroid kicks a ball. The table shows the height, h, in metres, of the ball over time, t, in seconds, after it is kicked into the air.
a) Graph the data.
b) Write the quadratic relation in vertex form that models this situation.
c) What is the equation of the relation in standard form?

t	h
0	0
3	16.2
6	28.8
9	37.8
12	43.2
15	45
18	43.2
21	37.8
24	28.8
27	16.2
30	0

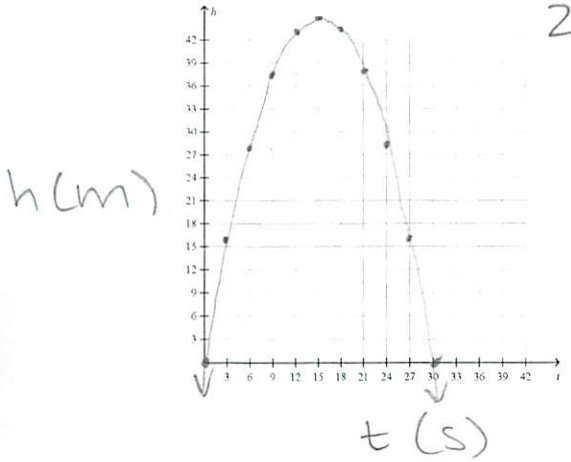
$y = a(x-15)^2 + 45$

$0 = a(0-15)^2 + 45$

$-45 = a(225)$

$-\frac{1}{5} = a$

b) $y = -\frac{1}{5}(x-15)^2 + 45$



16. (1 point) Express the quadratic function $y = -3x^2 + 12x - 10$ in vertex form.

$y = -3(x^2 - 4x + 4 - 4) - 10$

$y = -3(x-2)^2 + 12 - 10$

$y = -3(x-2)^2 + 2$

$V(2, 2)$

17. a) $B^2 - 4AC$

$81 - 4k = 0$

$81 = 4k$

$81/4 = k$

b) $81 - 4k > 0$

$81 > 4k$

$81/4 > k$

c) $81 - 4k < 0$

$81 < 4k$

$81/4 < k$

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17. (1 point) For what values of k does the equation $x^2 + 9x + k = 0$ have
a) one real root? $= 0$
b) two distinct roots? > 0
c) no real roots? < 0

18. (1 point) Find the value of k that makes the expression $x^2 + 52x + k$ a perfect square trinomial.

$(x+26)^2$ $\therefore$ $k = 676$

19. (1 point) Factor the quadratic $6(x-5)^2 + 126(x-5) + 324$ completely.

let $(x-5) = a$

$6a^2 + 126a + 324$

$6(a^2 + 21a + 54) \rightarrow 6(a+18)(a+3)$

$6(x-5+18)(x-5+3)$

20. (1 point) Solve the quadratic function $y = 5x^2 + 20x - 6$ by completing the square. Round roots to the nearest hundredth, if necessary.

$y = 5(x^2 + 4x + 4 - 4) - 6$

$y = 5(x+2)^2 - 20 - 6$

$y = 5(x+2)^2 - 26 = 0$

$5(x+2)^2 = 26$

$(x+2)^2 = \frac{26}{5}$

$x + 2 = \pm\frac{\sqrt{26}}{\sqrt{5}}$

$x = -2 \pm \frac{\sqrt{26}}{\sqrt{5}}$

$x = 0.28, -4.28$

21. (1 point) Use the quadratic formula to find the roots of the equation $x^2 + 4x - 21 = 0$. Express your answers as exact roots.

$x = \frac{-4 \pm \sqrt{16 - 4(-21)}}{2}$

$x = \frac{-4 \pm 10}{2} = 3, -7$

$6(x+13)(x-2)$

22. (1 point) Determine the number of real roots for the equation $3x^2 = 8x - 4$. Then, find the roots of the equation by
a) using the quadratic formula
b) factoring

$3x^2 - 8x + 4 = 0$

$64 - 4(3)(4) > 0$

$\therefore$ 2 real roots

a) $x = \frac{8 \pm \sqrt{64 - 4(3)(4)}}{6} = \frac{8 \pm 4}{6} = 2, 2/3$

23. (1 point) Find the x-intercepts of the quadratic function $y = 3x^2 - 10x + 6$. Express your answers as exact values.

$x = \frac{10 \pm \sqrt{100 - 4(3)(6)}}{2(3)}$

$= \frac{10 \pm \sqrt{28}}{6}$

$= \frac{10 \pm 2\sqrt{7}}{6}$

$x = \frac{5 \pm \sqrt{7}}{3}$

b) $3x^2 - 8x + 4 = 0$

$(3x - 2)(x - 2) = 0$

$x = 2/3, 2$

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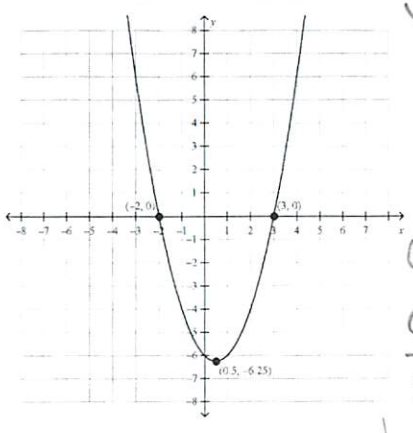
24. (1 point) Write the equation of this parabola.



$y = a(x-0.5)^2 - 6.25$

$P(3,0)$

$x \quad y$

$0 = a(3-0.5)^2 - 6.25$

$6.25 = a(2.5)^2$

$\frac{6.25}{2.5^2} = a$

$a = 1$

$y = (x-0.5)^2 - 6.25$

25. (1 point) Simplify each expression.

a) $\sqrt{20} + \sqrt{5}$

b) $5\sqrt{12} - 2\sqrt{27}$

c) $\sqrt{3}\left(\sqrt{5} + \sqrt{7}\right)$

d) $\frac{24\sqrt{14}}{8\sqrt{2}}$

a) $2\sqrt{5} + \sqrt{5} = 3\sqrt{5}$

b) $5(2\sqrt{3}) - 2(3\sqrt{3})$

$10\sqrt{3} - 6\sqrt{3} = 4\sqrt{3}$

c) $\sqrt{15} + \sqrt{21}$

d) $3\sqrt{7}$

26. (1 point) Expand and simplify. State any restrictions on the values for the variables.

a) $(3\sqrt{m} - 7\sqrt{n})(3\sqrt{m} + 7\sqrt{n})$

b) $\left(8\sqrt{x} - 5\sqrt{\frac{x}{3}}\right)^2$

a) $9m + 21\sqrt{mn} - 21\sqrt{mn} - 7n$

$9m - 7n$

b) $\left(8\sqrt{x} - 5\sqrt{\frac{x}{3}}\right)\left(8\sqrt{x} - 5\sqrt{\frac{x}{3}}\right)$

$64x - 40\sqrt{\frac{x^2}{3}} - 40\sqrt{\frac{x^2}{3}} + 25\left(\frac{x}{3}\right)$

$64x - 80\sqrt{\frac{x^2}{3}} + \frac{25x}{3} \rightarrow 64x - \frac{80x\sqrt{3}}{3} + \frac{25x}{3} \rightarrow \frac{192x - 80x\sqrt{3} + 25x}{3} \rightarrow \frac{217x - 80x\sqrt{3}}{3}$

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27. (1 point) Solve $4 - \sqrt{4 + x^2} = x$.

$(4-x)^2 = \left(\sqrt{4+x^2}\right)^2$

$16 - 8x + x^2 = 4 + x^2$

$-8x = -12$

$x = 3/2$

28. (1 point) Solve $\left(\sqrt[3]{5m+2}\right)^3 = 3^3$.

$5m + 2 = 27 \quad 5m = 25$

$m = 5$

Determine if the function f(x) is the simplified form of g(x). If it is, state the non-permissible values. If it is not, determine the corrected simplified form, including the non-permissible values.

29. (1 point) $g(x) = \frac{x^2+3x+2}{x+1}$, $f(x) = x+2$ ✓

$\frac{(x+2)(x+1)}{(x+1)}$

30. (1 point) $g(x) = \frac{2x^2-7x+3}{x-3}$, ~~$f(x) = 2x+1$~~ $f(x) = 2x-1$; $x \neq 3$.

$\frac{(2x-1)(x-3)}{x-3}$

31. (1 point) $g(x) = \frac{6x^2+x-12}{2x+3}$, $f(x) = 3x-4$ ✓

$\frac{(3x-4)(2x+3)}{2x+3}$

Simplify each expression and state any non-permissible values.

32. (1 point) $\frac{x^2-2x}{x+1} \times \frac{x^2-1}{x^2+x-6}$

$\frac{x(x-2)}{x+1} \cdot \frac{(x+1)(x-1)}{(x+3)(x-2)} = \frac{x(x-1)}{x+3}$

$x \neq -1, 2, -3$

33. (1 point) $\frac{4x-1}{x^2+7x+12} \div \frac{2x-1}{x^2+x-12}$

$\frac{4x-1}{(x+4)(x+3)} \cdot \frac{(x+4)(x-3)}{2x-1}$

$(x+4)(x-3)$

34. (1 point) $\frac{2x^2+x-1}{6x^2-x-2} \times \frac{2x^2+3x+1}{2x^2+5x+3} \div \frac{x^2+2x+1}{x+3}$

$\frac{(2x-1)(x+1)}{(3x-2)(2x+1)} \cdot \frac{(2x+1)(x+1)}{(2x-1)(x+3)} \cdot \frac{(x+3)}{(x+1)(x+1)}$

$= \frac{1}{3x-2} \quad x \neq 2/3, \pm 1/2, -3, -1$

$\frac{(4x-1)(x-3)}{(x+3)(2x-1)}$

$x \neq \pm 3, -4, 1/2$

$\frac{5x+1}{2(x+1)(x-1)} + \frac{2(x+1)}{2(x-3)(x-1)}$

$\frac{(3x+1)(x-3) + 2(x+1)^2}{2(x+1)(x-1)(x-3)}$

$3x^2-8x-3+2x^2+4x+2$

$\rightarrow 5x^2-4x-1$

$\rightarrow \frac{(5x+1)(x-1)}{2(x+1)(x-1)(x-3)}$

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Simplify each expression and state any non-permissible values.

$\frac{5x+1}{2(x+1)(x-3)}$ $x \neq \pm 1, 3$

35. (1 point) $\frac{3x+1}{2x^2-2} + \frac{2x+2}{2x^2-8x+6}$

$2(x^2-1)$ $2(x^2-4x+3)$

36. (1 point) $\frac{5}{x^2-1} - \frac{2}{x^2+4x+3} + \frac{3}{x^2+2x-3}$

$(x+1)(x-1)$ $(x+3)(x+1)$ $(x+3)(x-1)$

37. (1 point) Evaluate each absolute value expression.

a) $6 + |5-11| = 12$

b) $-2 - |7| + |3-2| = -8$

c) $\frac{24}{-|12+(-2)|} = -4$

d) $|2| \times (-|-3|) \times (-2) = 12$

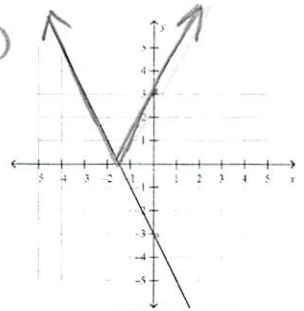
38. (1 point) Given the graph of $y = f(x)$:

a) sketch the graph of $y = |f(x)|$

b) state the domain and range

c) express $y = f(x)$ as a piecewise function.

a)



b) D: $x \in R$

R: $y \geq 0$

c) $f(x) = \begin{cases} -2x-3, & x < -3/2 \\ 2x+3, & x \geq -3/2 \end{cases}$

39. (1 point) Solve the absolute value equation $|x^2-3x-15| = 25$ algebraically.

$\oplus\ x^2-3x-15=25$

$x^2-3x-40=0$

$(x-8)(x+5)=0$

$x=8, -5$

$\ominus\ x^2-3x-15=-25$

$x^2-3x+10=0$

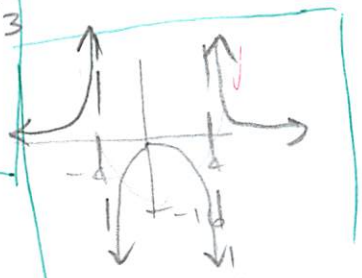
no solution

40. (1 point) Graph each reciprocal function. For each graph, state the non-permissible values and the equation of the vertical asymptote(s).

a) $y = \frac{1}{3x-2}$

b) $y = \frac{1}{x^2-16}$

$x = 2/3$



$x = \pm 4$

y-int: $(0, -1/16)$

41. (1 point) Solve the system graphically.

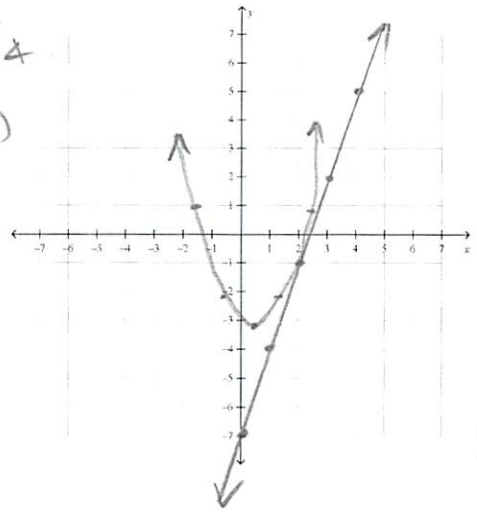
$y = 3x - 7$

$y = x^2 - x - 3$

$y = (x^2 - x + 1/4) - 1/4 - 3$

$y = (x-1/2)^2 - 13/4$

$V(1/2, 13/4)$



solution:

$(2, -1)$

★ you can check algebraically!

36.)

$5(x+3) - 2(x-1) + 3(x+1)$

$\rightarrow 5x+15-2x+2+3x+3$ } numerator

$\rightarrow 6x+20$

$\rightarrow \frac{2(3x+10)}{(x+1)(x-1)(x+3)}$

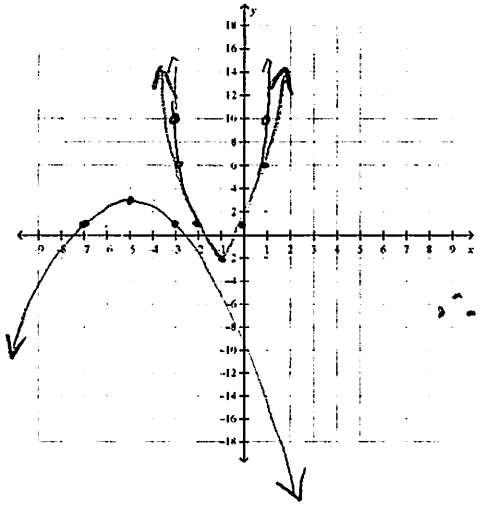
$x \neq \pm 1, -3$

42. (1 point) What is (are) the solution(s) to the following system?

$y = -\frac{1}{2}(x+5)^2 + 3$ V(-5, 3)

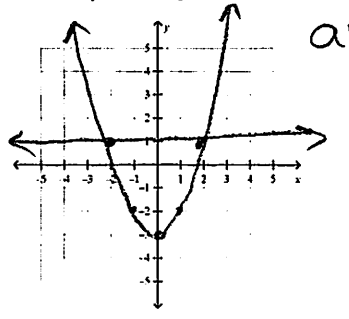
$y = 3(x+1)^2 - 2$ V(-1, -2)

Solve graphically.



∴ no solution.

43. (1 point) a) Sketch a system of linear-quadratic equations that has solution (–2, 1) and (2, 1).
b) What equations did you use?



answers may vary!

$y = x^2 - 3$

$y = 1$

44. (1 point) Solve the system of equations by substitution.
$y = 2x^2 - 2x - 3$ and $y = -x^2 - 2x - 3$

$2x^2 - 2x - 3 = -x^2 - 2x - 3$

$3x^2 = 0$

$x = 0$

$y = 2(0) - 2(0) - 3 = -3$

(0, -3)

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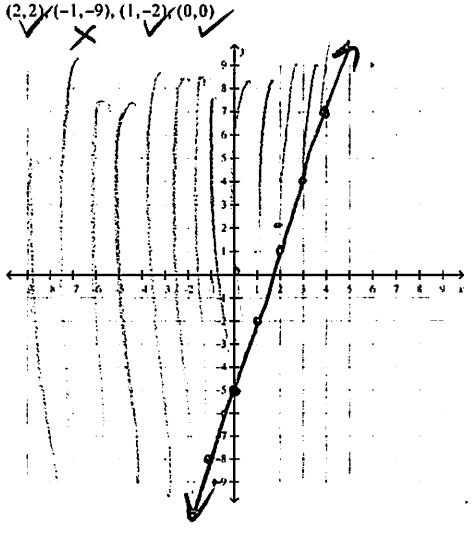
45. (1 point) Which of the given ordered pairs belong to the solution to the inequality $y \geq 3x - 5$? Use a graph of the inequality to show your reasoning in each case.

$(2,2)$ $(-1,-9)$, $(1,-2)$ $(0,0)$



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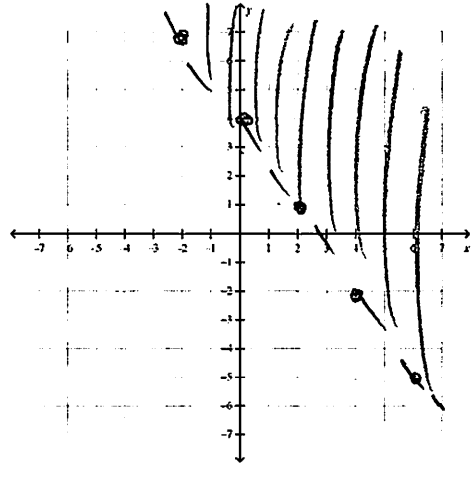
46. (1 point) Graph the inequality $3x + 2y - 8 > 0$.

$2y > -3x + 8$

$y > \frac{-3}{2}x + 4$



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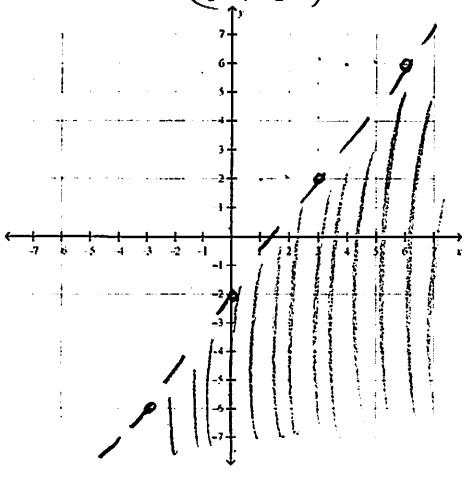
47. (1 point) Graph the inequality $\frac{x}{3} - \frac{y}{4} > \frac{1}{2}$.

$\times 12$. $4x - 3y > 6$.

$4x - 6 > 3y$

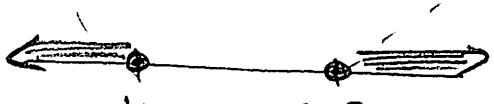
$\frac{4}{3}x - 2 > y$



48. (1 point) What is the solution for $2x^2 - 7x \geq -3$?

$2x^2 - 7x + 3 \geq 0$.

$(2x - 1)(x - 3) \geq 0$



$x \leq 1/2$, $x \geq 3$.

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49. (1 point) What is the graphical solution to the quadratic inequality $xy < -4$?

$y < -\frac{4}{x}$